Exploring Meteorite Mysteries

Lesson 18 — Antarctic Meteorite Teams

"Is there a career for me?"

Objectives

Students will:

- view slides and read about meteorite collecting.
- explore science careers.
- evaluate characteristics and skills of scientific teams dealing with meteorites.
- create scientific teams.
- make written and oral presentations about chosen scientific teams.

Background — Antarctic Meteorite Teams

Antarctica is a special place for collecting meteorites. Since the discovery of nine meteorites on the ice in 1969, over 17,000 fragments of meteorites have been recovered by U.S., Japanese, and European expeditions. Several factors that contribute to this huge number of meteorites are listed below.

— It is easier to find meteorites on ice than on soil or vegetation, so many small meteorites are recovered on the ice.

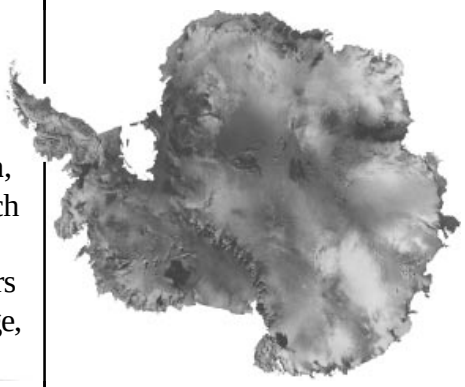
— The movement of Antarctic ice helps to concentrate meteorites where the ice comes to a rock barrier. This concentration makes it difficult to tell which meteorites are individuals and which are fragments from large meteorite showers. Thus the 17,000 meteorite fragments may come from only 3,000 separate meteorites.

— The ease of collecting large numbers of meteorites led to systematic searches by various national and international groups, which in turn led to discovery of many more meteorites.

The recovery of large numbers of Antarctic meteorites led to an increased interest in studying meteorites in laboratories around the world. Facilities were created where the new meteorites could be classified, distributed and stored. **Meteorite recovery, curation, and research**, is done by teams of scientists working together on a common goal. Each of the teams has a leader, an assistant leader and several workers with different qualifications. Factors that help in the selection of team members are education, experience, special skills and sometimes personality — age, race, and gender are less important.

About This Lesson

This lesson is designed to enhance students' awareness of scientific career possibilities and requirements. A series of slides will provide students with background information about expeditions to Antarctica to recover meteorites. Meteorite curation and research will be discussed, emphasizing education and skill requirements. After considering potential team candidates, students will work in cooperative groups to create three scientific teams that deal with the recovery, curation, and study of meteorites from Antarctica.



Materials

- ❑ Slide Set, Antarctic Meteorite Teams, projector and screen
- ❑ Student Background reading — Antarctic Meteorite Teams *(pgs. 18.5-18.7)*
- ❑ Member Profiles for Prospective Antarctic Meteorite Teams — Profiles of scientists and other potential team members *(pgs. 18.8-18.9, one for each student)*
- ❑ large sheet of paper and markers to record results, per group

Procedure

Advanced Preparation

1. Assemble materials.
2. Review background.
3. Consider possible options listed in step 3 of Classroom Procedure and the extensions at the end of the lesson — incorporate if desired.
4. Copy Member Profiles and Student Background sheets as needed.

Classroom Procedure

1. Show slide presentation about Antarctic meteorites.
2. Conduct a teacher led discussion or brainstorm session to explore the importance of team members who are skilled and cooperative. (What skills and qualities do Antarctic Meteorite team members require?)
3. Divide students into three or more groups. Distribute Member Profiles and Student Background sheets to each student.

   Options:

   - Use the profiles as they are listed and give each team a full listing.
   - Cut individual profiles into strips and have students draw by separate gender groupings.
   - Cut off the number and gender designation on each profile and let students draw slips randomly.
   - Have students make up their own profiles.

   ***Note**: A profiled person may fit on several different teams (this really happens).*
4. Each group has the responsibility of creating one of the following teams: **collection, curation,** or **research**. There may be more than one team per category. (The teacher may help guide groups to ensure that at least one of each team category is formed.)
5. At some time in the group discussion have each student select a "person" whom they will represent in this activity. Selections are made from the Member Profiles for Prospective Antarctic Meteorite Teams or from profiles created by the students.
6. Groups evaluate team members' skills and education first. Then decide what team category they will best be able to create as a whole group. Students may make up additional qualifications or skills for any of the profiled people. Consider the years of "experience" and expand on the possibilities. There are many people working in fields not associated directly with their degree(s). Flexibility will be necessary — some individuals may need to move to another group if skills do not match the teams' needs.

7. Make specific job assignments for each person based on the needs of the team and the individual characteristics and skills. Make up information about the character and abilities of your "person" that will allow them to be better team members. (Individuals might be chosen for more than one team and have different roles on each team.)
8. The groups' choices and job assignments should be recorded and shared with the class. Groups should be prepared to explain their decisions.

Questions

1. Imagine that you are the organizers of an expedition to collect meteorites.
   - — What kinds of personality traits would make the team's job more enjoyable?
   - — What specific items would you include in your plan for transportation, clothing, shelter, food, water, and communication? Explain why you need each item.
   - — What would you do in your spare time on the meteorite collecting expedition?
2. What other things, in addition to education, interests and skills, would be important in choosing your meteorite collection, curatorial, or research team? What other things would **not** be important?
3. Would **you** actually want to collect, curate or study meteorites? Explain your answer.

Vocabulary

curation, research, classification, expedition, technician, Bachelor's Degree, Master's Degree, Doctor of Philosophy (Ph. D.)

Evaluation

The groups' lists and explanations could be used as the evaluations of this activity.

Extensions

1. The class could be required to reach a consensus for one set of teams based on the individual group recommendations.
2. Each group could role play the team members and introduce themselves to the class.
3. Each group member could choose a team applicant and write an acceptance/rejection letter explaining the group's decision.
4. Research other historic Antarctic expeditions and compare them to present day expeditions.

Lesson 18 — Student Background

Meteorite Recovery Team

Collecting meteorites in Antarctica is a difficult and potentially dangerous task. Antarctica is the coldest continent on Earth, with summer temperatures of 0 to -25°C and wind chills that make it feel much colder. Teams work for about two months during Antarctic summer (November to January) in the remote regions along the Transantarctic Mountains. Because meteorites are found long distances from the few scientific bases, teams are transported to camps by air and must have everything they need to survive. They have lots of food and fuel, special clothing and tents for protection, snowmobiles for transportation, and radios for communication.

Team Members — Their Skills, Duties, and Responsibilities

Team Leader and Assistant

- — have scientific backgrounds.
- — write the proposal for funding and support to the National Science Foundation which operates bases and oversees Antarctic science.
- — plan which locations to search for meteorites.
- — arrange for transportation and equipment.
- — select the other team members and lead the field expedition.

Ice Specialist

- — is responsible for finding safe routes on ice and avoiding crevasses.
- — manages the mapping project and prepares a computer database of locations of all meteorites.

Team Members (3-4)

- — are scientists or science students selected by the leaders for their interest in meteorites and desire to work in Antarctica.
- — are in good health and physical condition.
- — are often from the curation and research teams.
- — have a personality suitable to working and living closely with team members for two months in this isolated, hazardous environment. The members of U.S. teams have included both men and women of many nationalities, with ages ranging from under 30 to over 60.

Lesson 18 — Student Background

U.S. Antarctic Meteorite Curation Teams

There are two curation teams, one at NASA's Johnson Space Center and the other at the Smithsonian Institution's National Museum of Natural History. They share the tasks of classification, distribution, and storage. Each team consists of curators, scientists, specialists, and technicians. Duties of team members are often interchangeable. Curatorial staff members may have a variety of educational backgrounds. Members of the curation team may also serve on the collection team.

Team Members — Their Skills, Duties, and Responsibilities

Curators

- — write funding proposals.
- — interact with administrators, oversight committees, other curators, the field team, research scientists, and the general public.
- — classify both Antarctic meteorites and other meteorites sent by individuals.
- — direct the work of the laboratory scientists, computer specialists, and technicians.
- — publish classifications in newsletters and bulletins.
- — some also conduct research projects.
- — some work on public displays and education.

Computer Specialist

- — manages the database of meteorite classifications and weight inventories.
- — prepares data for publication in newsletters and reports to administrators and committees.

Laboratory Scientists

- — do the actual handling of meteorites.
- — describe new meteorites in laboratory notes.
- — take subsamples to distribute to researchers.

Technicians

- — prepare meteorite thin sections for microscopic examination and analysis.
- — maintain the laboratory equipment, and clean special tools and containers.

Lesson 18 — Student Background

Meteorite Research Team

The research group usually consists of university or college professors, research staff, post doctoral associates, graduate, and undergraduate students. All members of the team need to be skilled in the use of computers. Members of the research team participate on the collection team.

Team Members — Their Skills, Duties, and Responsibilities

Lead Researcher

- — is usually a professor who teaches classes or may be a research staff member of an institute.
- — writes research proposals to secure funding.
- — directs the research.
- — writes some of the papers reporting the results.
- — makes oral presentations to colleagues at scientific meetings.

Research Associate/Assistant

- — is a research staff member, a post doctoral associate, or sometimes a graduate student.
- — conducts much of the actual research, including requesting meteorites from the curation team.
- — interprets and reports the results.
- — writes papers.
- — makes oral presentations to colleagues at scientific meetings.

Technician

- — may be a regular employee or a student employee in training to be a technician or scientist.
- — maintains and operates the laboratory equipment.
- — does many of the experiments or analyses.
- — contributes to written articles.

Member Profiles for Prospective Antarctic Meteorite Teams

Member	Education / Experience	Interests / Skills
# 1 Geology Female	Univ. of Hawaii Masters Degree	Backpacking Cross-country skiing
# 2 Communications Female	U.S. Army Bachelors Degree + 8 years	Computer programming Reading
# 3 Creative Writing Male	Alvin Community College Associates Degree + 15 years	First aid Photography
# 4 Chemistry Male	Texas A&M - Ph.D. Student Masters Degree + 2 years	Piano Gourmet cooking
# 5 Agriculture Male	Texas Tech Bachelors Degree + 10 years	Bird watching Ham radio
# 6 Pilot Male	U.S. Navy Bachelors Degree + 5 years	Horses Stamp collecting
# 7 Physics/Geochemistry Female	Oregon State Univ. Ph. D. + 5 years	Sail boarding Classical music
# 8 Physical Sciences Female	Univ. of Texas at Dallas Bachelors Degree + 40 years	Baking bread Computers
# 9 Accounting Male	Univ. of California Bachelors Degree + 15 years	Surfing Restoring cars
# 10 Math Female	Univ. of Texas - Ph.D. Student Masters Degree + 5 Years	Geology Conservation
# 11 Astronomy/ Male **Planetary Science**	Univ. of Arizona Ph. D. + 15 years	Tennis Car repair
# 12 English Male	Univ. of Houston Masters Degree + 5 Years	Desktop publishing Bicycling
# 13 Mechanical Engineer Female	Southern Methodist Univ. Masters Degree + 1 year	Golf Chess
# 14 Business Male	Austin College Bachelors Degree + 2 years	Sailing Microscopes

# 15 Female	**Physical Education/ Geochemistry**	TCU - Ph.D. Student Masters Degree + 10 years	Stock market analysis Weaving
# 16 Female	**Forestry**	Univ. of Alaska Ph.D. + 1 year	Woodcarving Cooking
# 17 Female	**Music**	Rice Univ. Masters Degree + 5 years	Electronics Texas history
# 18 Male	**Chemical Engineer**	Baylor Univ. Masters Degree + 2 years	Archery Videotaping
# 19 Male	**Electrician**	San Antonio Comm. Coll. Associates Degree +15 years	Soccer Radio controlled airplanes
# 20 Female	**Theater**	Trinity Univ. Bachelors Degree + 5 years	Short story writing Rock climbing
# 21 Male	**Dentist**	Louisiana State Univ. DDS + 5 years	Model building Crossword puzzles
# 22 Male	**Psychology**	Univ. of Florida Masters Degree + 15 years	Jet skiing Horses
# 23 Female	**Marine Biology**	Univ. of Delaware Masters Degree + 5 years	Opera House building
# 24 Male	**Photography**	U.S. Air Force Masters Degree + 2 years	Kayaking Bowling
# 25 Male	**Electrical Engineer**	Univ. of Oklahoma Bachelors Degree + 30 years	Running Square dancing
# 26 Male	**Electron microscopy**	Arizona State Univ. Ph.D. + 15	Meteorites Body building
# 27 Male	**Political Science**	Georgetown Univ. Bachelors Degree + 25 years	Marine mammals Canoeing
# 28 Female	**Scientific Illustrator**	Univ. of Michigan Masters Degree + 25 years	Gardening Karate
# 29 Male	**Computer Science**	Miss. State Univ. - Masters Student Bachelors Degree + 10 years	Baseball Sewing
# 30 Male	**Librarian**	Univ. of Missouri Masters Degree + 5 years	Exploring caves Cooking ethnic food